

Seismic Risk Map of the US

Name _____

Date _____

Per. _____

Task : Create a seismic map showing regions of high, moderate, and low risk of experiencing an earthquake.

Materials:

- Atlas or other map reference showing states of the US
- List of earthquakes in US from 1980-1994
- Blank US risk map with zone classification
- Colored pencils

Background:

In the past, every state in the US has either directly or indirectly experienced an earthquake. Some states have large numbers of earthquakes every year while others have them more infrequently. In this activity you will determine where the high and low risk earthquake areas are located in the US.

Procedure:

- Using the data from the table, write in the number of earthquakes in each state on the map provided.
- The US is divided into 4 earthquake zones based upon the risk of experiencing a damaging earthquake. For this activity, use the following classification: zone 0 = 0-24 earthquakes, zone 1 = 25-49 earthquakes, zone 2 = 50-99 earthquakes, zone 3 = 100+ earthquakes.
- Choose a color for each zone and color in the open bar by each zone shown above the map.
- Use this zone color code to color in your map.

Results:

Your colored earthquake risk map of the US.

Conclusion:

1. In which part of the US have earthquakes been concentrated?
2. Are there exceptions to #1? If so, which state(s) is/are the exception(s) found?
3. a) In which parts of the US is there a low risk of experiencing an earthquake?

b) Why is the risk so low at these locations?

4. Generally, when earthquakes of a magnitude 5 or greater strike an area, structural damage in buildings begins to be noticed.

a) Are there any states in zones 0 or 1 that have quakes of magnitude 5 or higher?

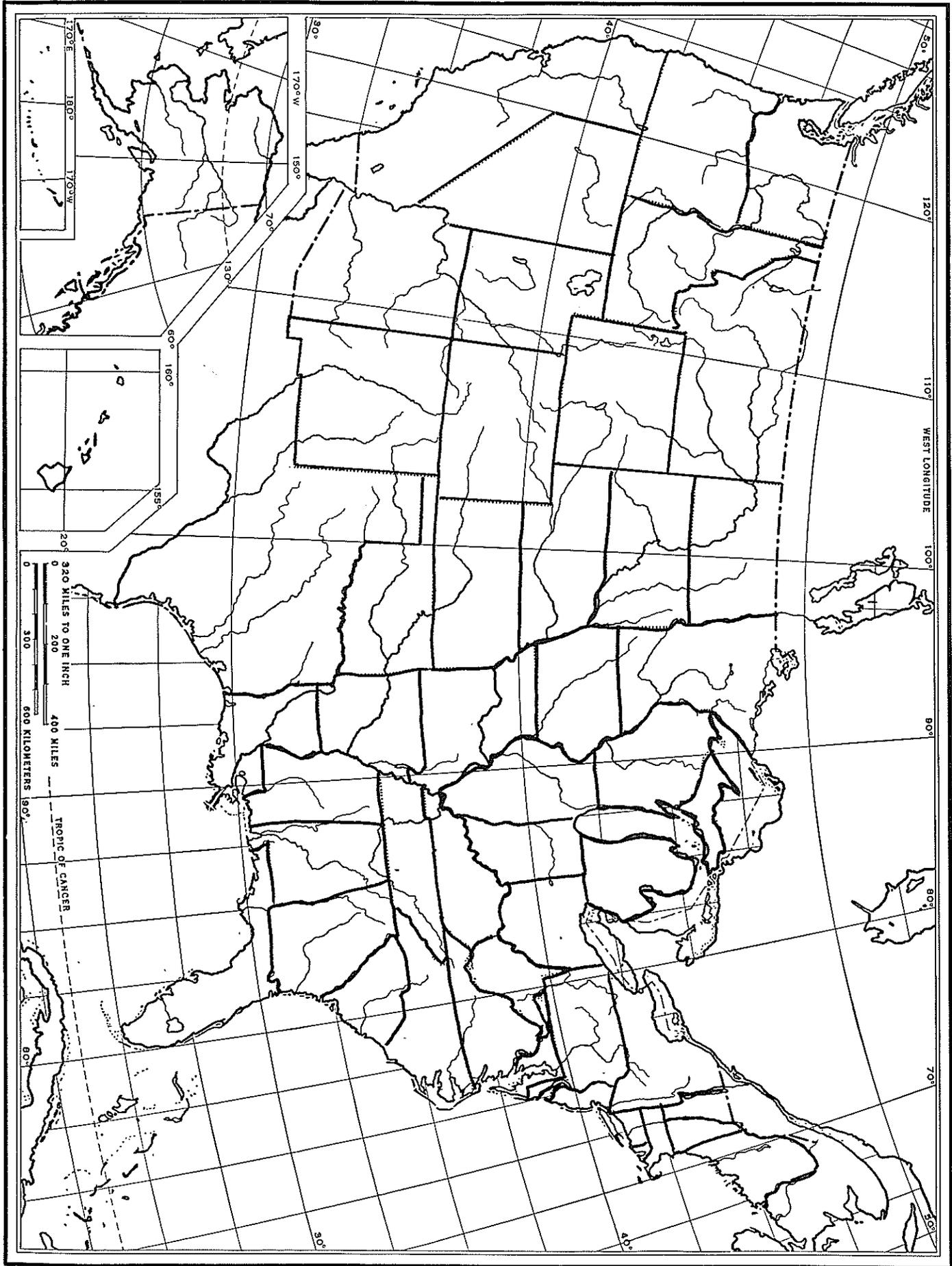
b) How might this change the zone classifications shown for these states?

5. Which region or regions should have some kind of earthquake preparedness plan? Explain.

EARTHQUAKES IN THE UNITED STATES, 1980-1994

State	No. of Events	Largest Magnitude
Alabama	8	4.5
Alaska	14,254	7.9
Arizona	71	4.0
Arkansas	55	4.7
California	11,072	7.6
Colorado	109	4.6
Connecticut	6	3.8
Delaware	1	2.4
Florida	0	--
Georgia	9	4.2
Hawaii	200	6.7
Idaho	900	7.3
Illinois	26	5.1
Indiana	11	4.1
Iowa	0	--
Kansas	14	4.0
Kentucky	27	5.2
Louisiana	1	3.8
Maine	21	4.3
Maryland	9	2.7
Massachusetts	13	3.7
Michigan	2	3.6
Minnesota	2	4.1
Mississippi	1	2.9
Missouri	51	5.0
Montana	373	4.8
Nebraska	11	3.8
Nevada	650	6.3
New Hampshire	19	4.7
New Jersey	7	3.2
New Mexico	66	5.0
New York	27	5.3
North Carolina	14	3.5
North Dakota	1	3.3
Ohio	17	5.0
Oklahoma	108	3.7
Oregon	327	6.9*
Pennsylvania	24	4.6
Rhode Island	2	2.7
South Carolina	29	3.5
South Dakota	14	4.6
Tennessee	52	4.3
Texas	32	3.9
Utah	273	5.9
Vermont	0	--
Virginia	6	3.5
Washington	668	5.5
West Virginia	2	3.5
Wisconsin	0	--
Wyoming	296	5.5

*This quake occurred in the Pacific Ocean about 70 miles off the coast of Oregon. The largest earthquake within Oregon during this time period was magnitude 4.3.



Zone 0 - (0 - 24 earthquakes)

Zone 1 - (25 - 49 earthquakes)

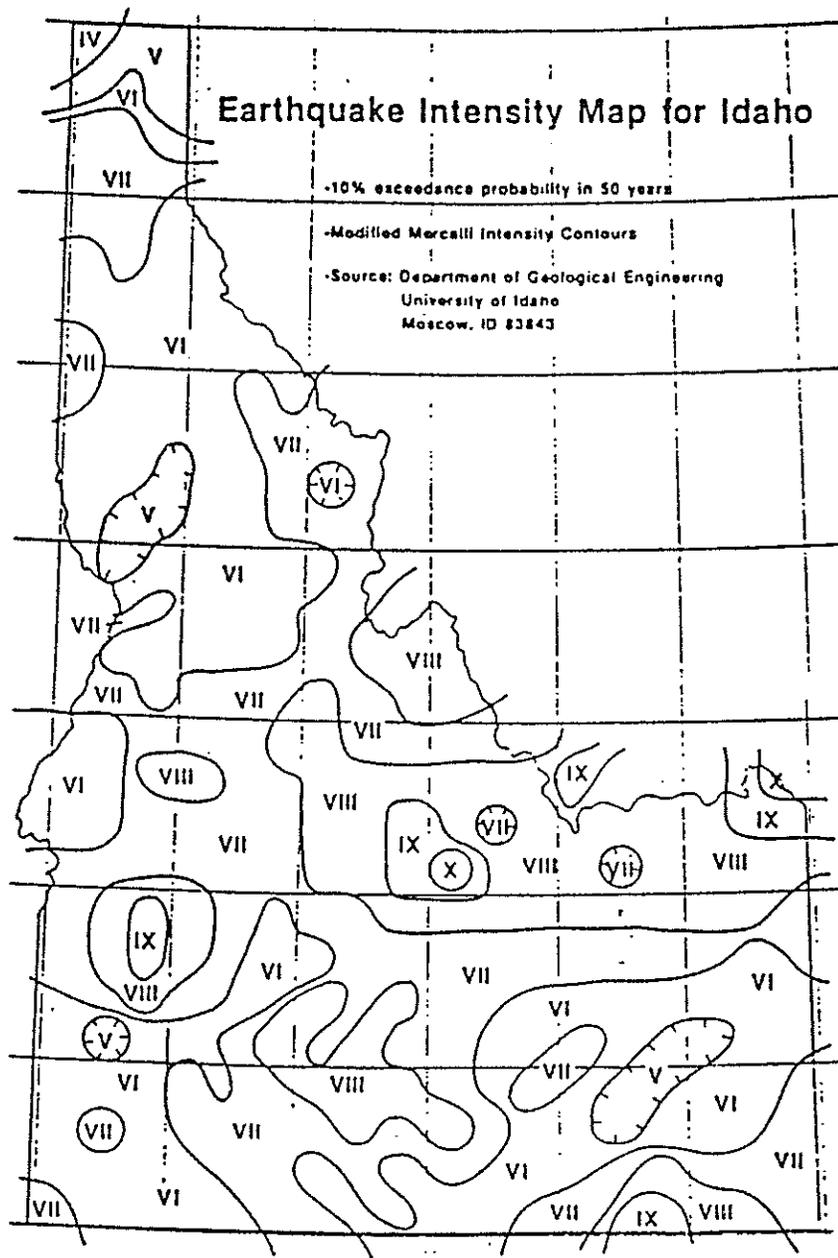
Zone 2 - (50 - 99 earthquakes)

Zone 3 - (100 + earthquakes)

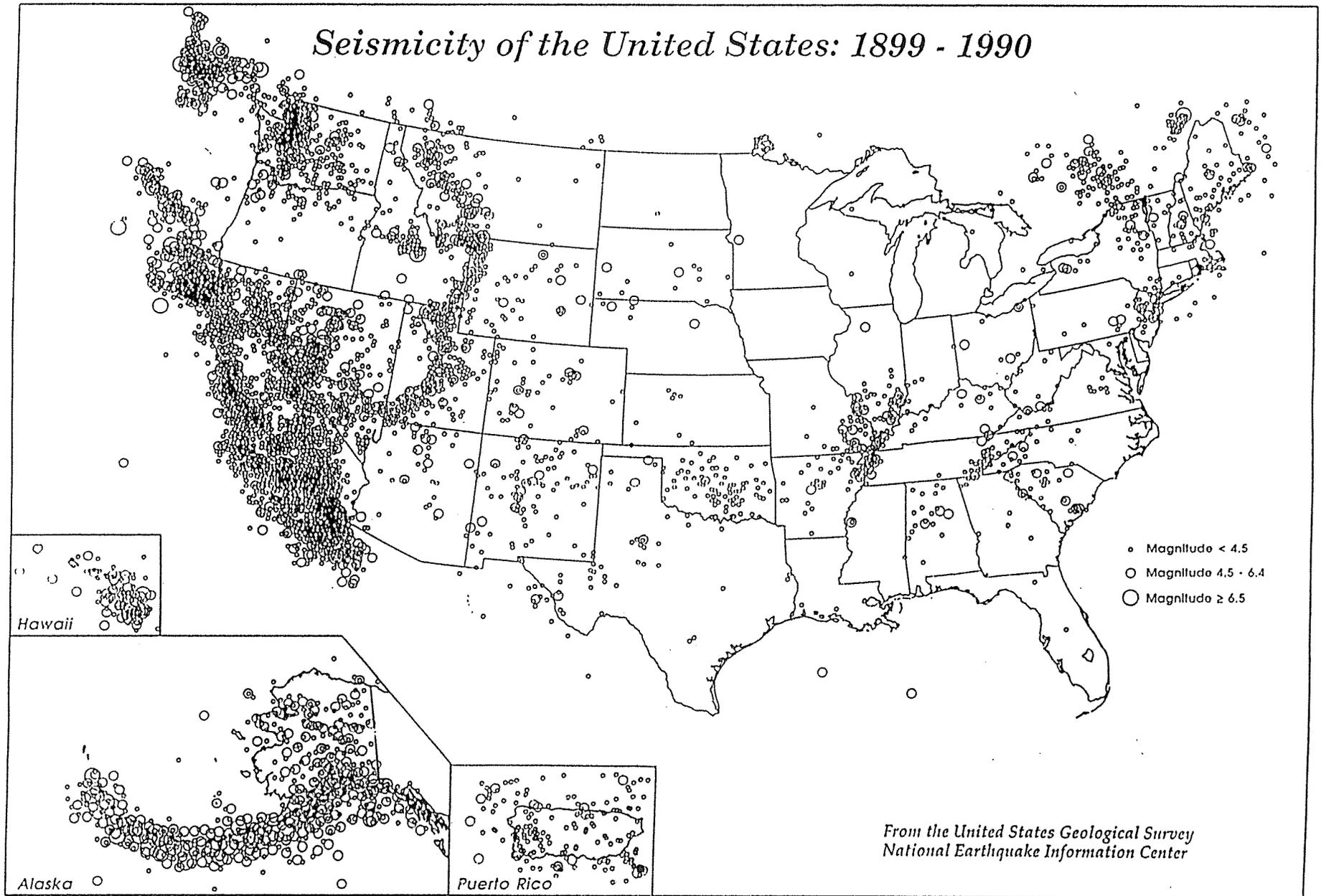


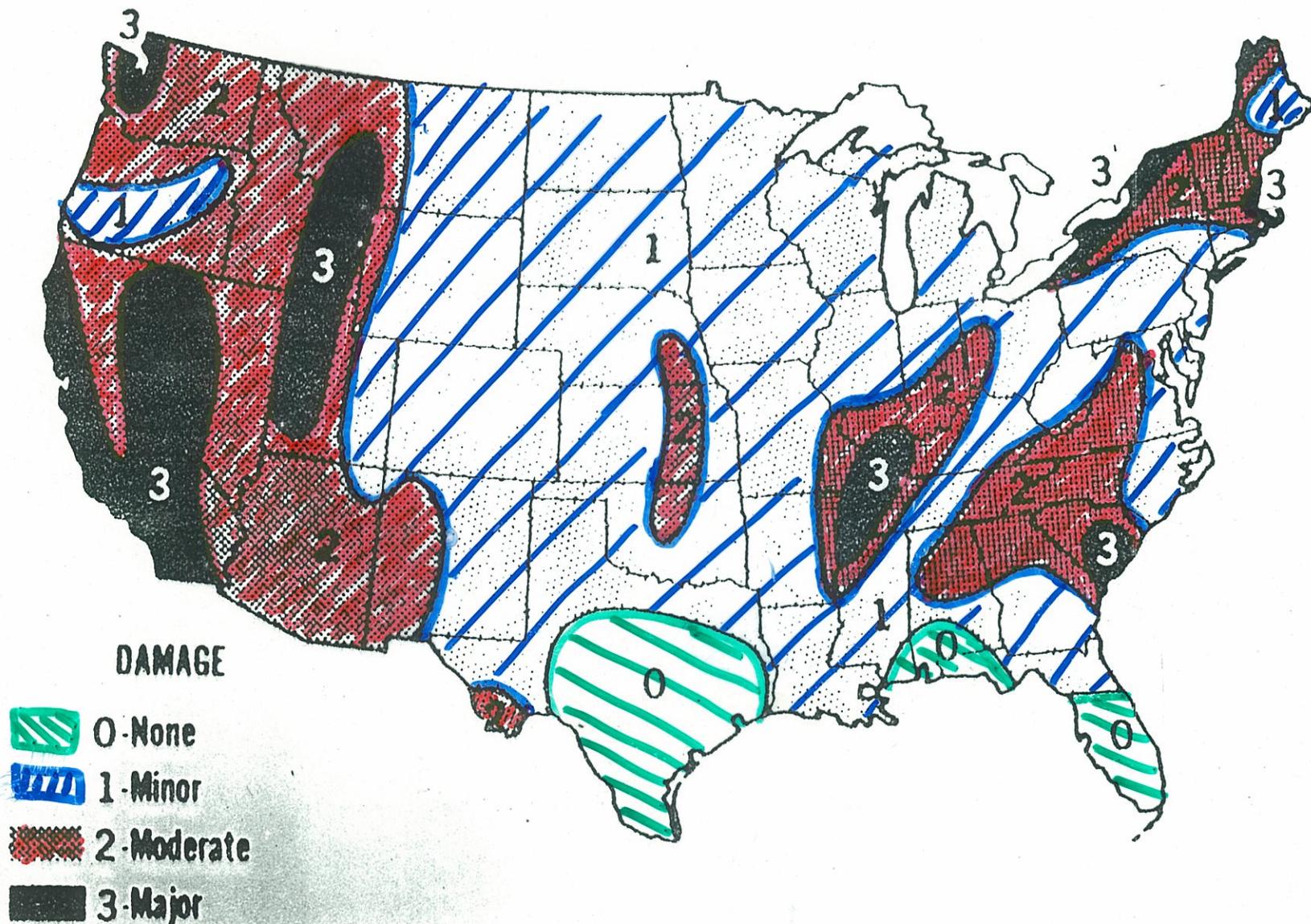
1. THE EARTHQUAKE THREAT IN IDAHO

Figure 1-3: Earthquake Intensity Map for Idaho

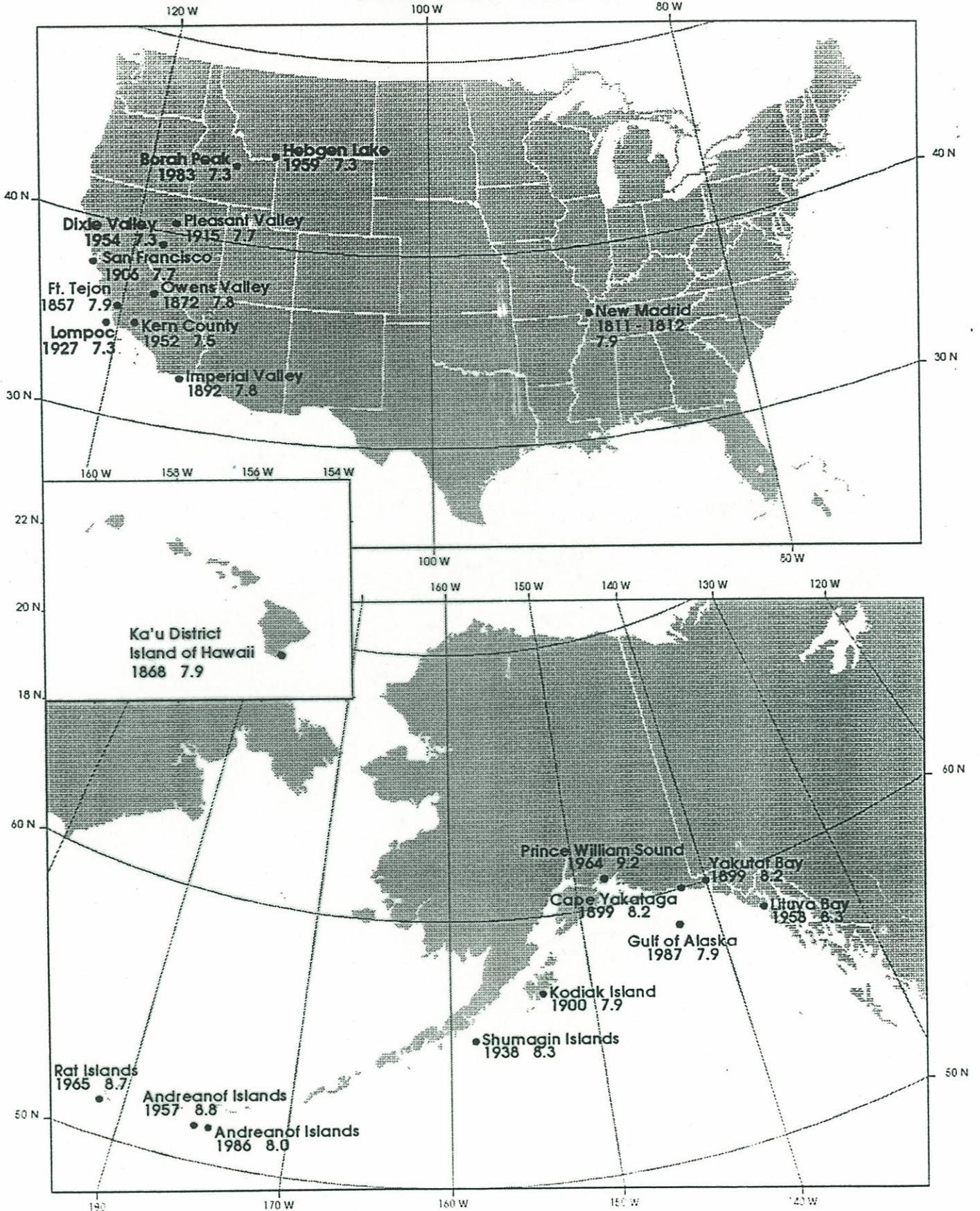


Seismicity of the United States: 1899 - 1990

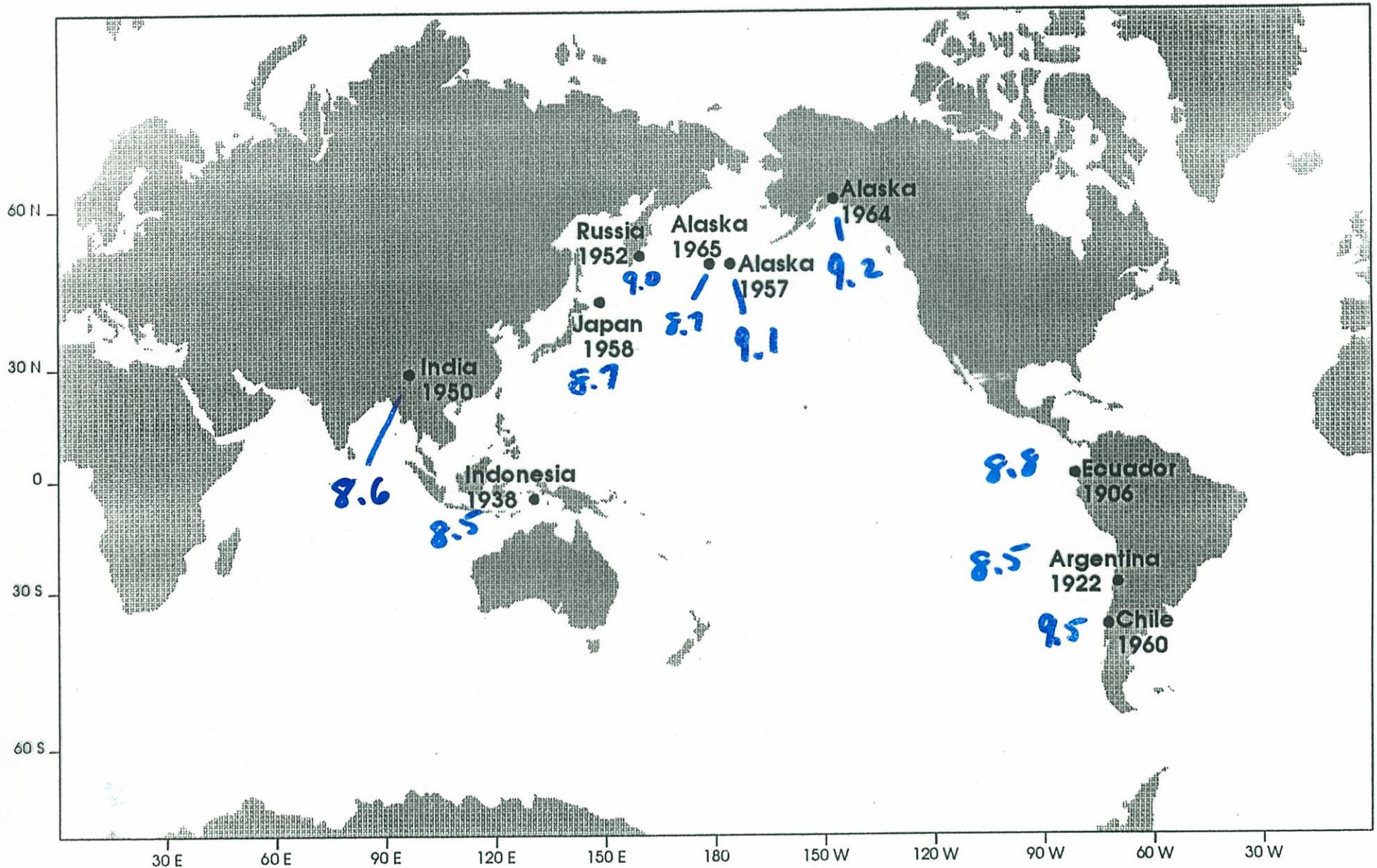




Largest Earthquakes in the United States 1900 to 1994

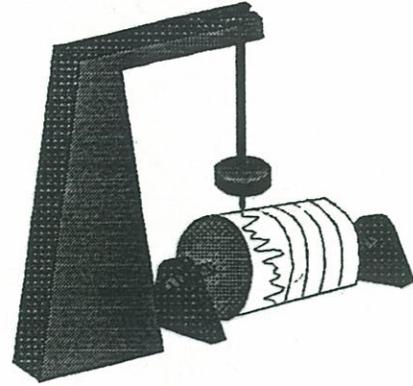


Ten Largest Earthquakes in the World 1900 to 1994



Prepared by the United States Geological Survey National Earthquake Information Center

How many EARTHQUAKES are located each year?



Thousands of earthquakes occur around the world every day, although most are so small they can only be detected by sensitive seismographs. As more and more seismographs are installed in the world, more earthquakes can be and have been located. However, the number of large earthquakes (magnitude 6.0 and greater) has stayed relatively constant. The U.S. Geological Survey's National Earthquake Information Center currently locates over 19,000 earthquakes per year.

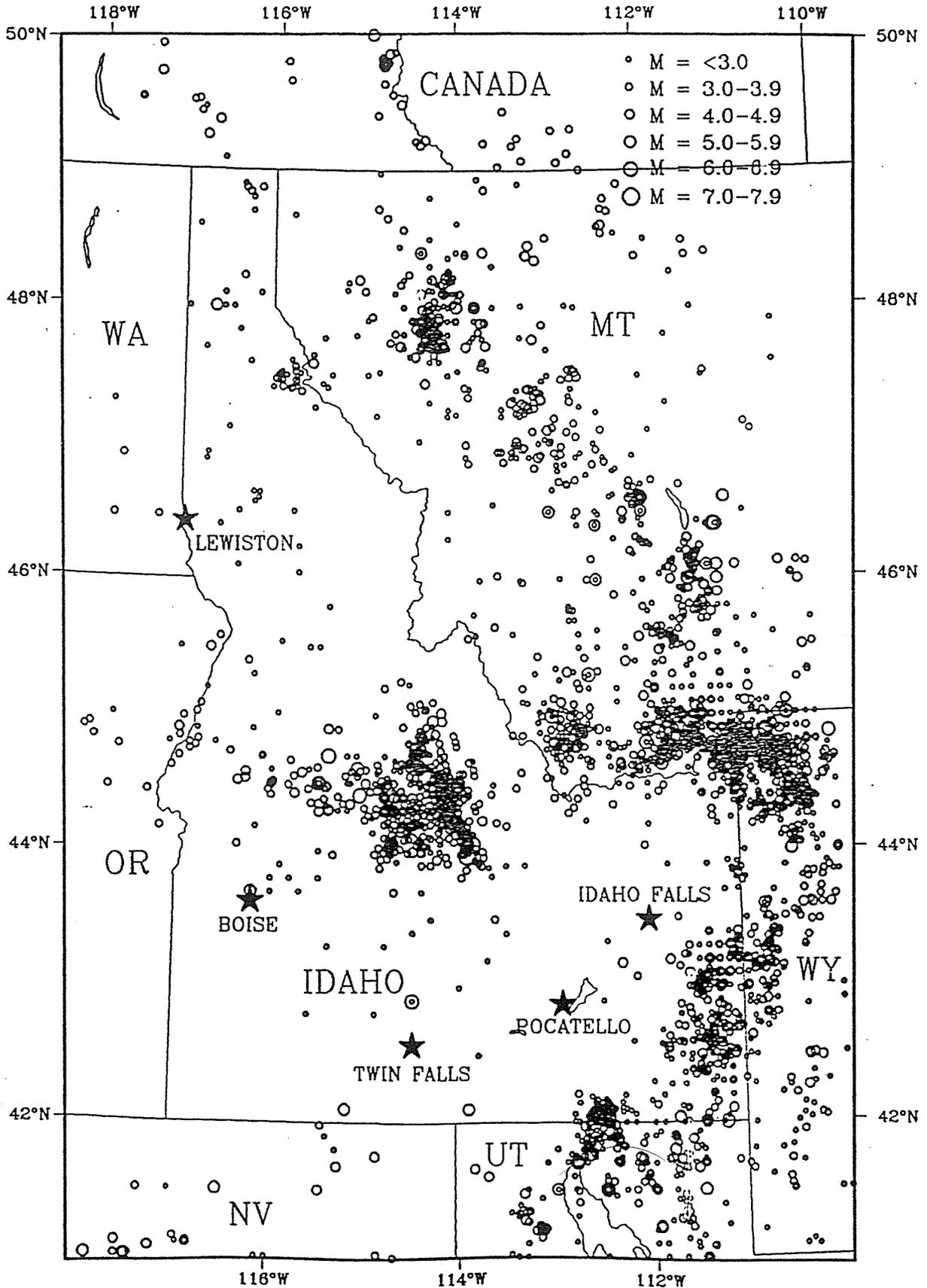
*Number of earthquakes located worldwide
from 1985 to 1994 by the USGS/NEIC*

Magnitude	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
8.0 to 9.9	1	1	0	0	1	0	0	0	1	2
7.0 to 7.9	13	5	11	8	6	12	11	23	15	13
6.0 to 6.9	110	89	112	93	79	115	105	104	141	161
5.0 to 5.9	1674	1665	1437	1485	1444	1635	1469	1541	1449	1542
4.0 to 4.9	4281	4476	4146	4018	4090	4493	4372	5196	5034	4544
3.0 to 3.9	1764	1942	1806	1932	2452	2457	2952	4643	4263	5000
2.0 to 2.9	935	1169	1037	1479	1906	2364	2927	3068	5390	5369
1.0 to 1.9	97	153	102	118	418	474	801	887	1177	779
0.1 to 0.9	0	0	0	3	0	0	1	2	9	17
unknown	4240	3218	2639	3575	4189	5062	3878	4084	3997	1944
Total	13115	12718	11290	12711	14585	16612	16516	19548	21476	19371

*Frequency of occurrence of earthquakes
based on observations since 1900*

Descriptor	Magnitude	Average Annually
Great	8 and higher	1
Major	7 - 7.9	18
Strong	6 - 6.9	120
Moderate	5 - 5.9	800
Light	4 - 4.9	6,200 (estimated)
Minor	3 - 3.9	49,000 (estimated)
Very Minor	less than 3	Mag. 2 - 3: about 1,000/day Mag. 1 - 2: about 8,000/day

Seismicity of IDAHO and Surrounding Areas 1800 - 1993



Teacher Notes for Risk Map Activity

- To introduce the activity, let students know that the basis for the zone classification used to create the map is just one indicator of seismic risk. They will incorporate some magnitude data into the conclusion of the activity. Allow one 47 min. class period to complete the map. The follow-up is accomplished the following day.
- The data set that was used was obtained at a previous Summer Workshop taught by IGS geologist Kurt Othberg, so it was both convenient and spanned a few years before and a few years after the Borah Peak Earthquake in Idaho. If additional year's data is used with this activity, the zone classification will need to be changed.
- Sequence the follow-up images in the following order:
 - The first image is the Seismicity of the US. It shows where earthquakes are concentrated when a much larger data set is used. It can also be used to demonstrate to students that seismologists look at regional rather than state data to assess risk.
 - The second map (Earthquake Risk Zone Map) shows an interpretation of risk using a 4 zone system based on data such as what was shown in the previous image.
 - Students always seem to want to know where the 'big ones'. The Largest Earthquakes in the US (provided at a previous summer workshop) is used to illustrate this. If you have access to a data projector, the USGS National Earthquake Information Center has some colored maps available online to project into the classroom. It is important to note for Idaho teachers that the Borah Peak Earthquake of 1983 lies within the top 10 largest 'quakes in the continental US. However, when Alaska data is revealed, we look at a new level of seismic magnitude.
 - The Largest Earthquakes in the World image is from the same source with the same datedness. It is interesting to show kids that the largest 'quakes generally follow the ring of fire.
 - The next image, "How many Earthquakes are located each year?" demonstrates to students that the larger the magnitude, the less frequent they occur (I interpret the low number of 1's and lower in the upper data set to mean that little or no effort was made to pinpoint the epicenter for such small 'quakes). The frequency data based upon data since 1900 is easier to interpret for students.
 - Finally, the Seismicity of Idaho image is very revealing for Idaho students. If you want a plotting of earthquake data for Idaho, it is available at the USGS site mentioned above.